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(54) ACTUATOR

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(57) ABSTRACT

The present invention provides a thinner actuator which is used for transferring a head of a magnetic disk drive and the like, and prevents resultant malfunctions.

In a moving part of the actuator in which the coil **1**, the holding member **2**, the housing **3**, and plate-shaped terminals **5***a* and **5***b* are integrated by resin molding, the plate-shaped terminals **5***a* and **5***b* are provided in the holding member **2** in the coil moving direction **6**, and the plate-shaped terminals **5***a* and **5***b* and the connecting parts **7***a* and **7***b* provided in the conductor end part of the flexible circuit board **7** are brought into surface contact, and the contacted portions are electrically connected with solder.

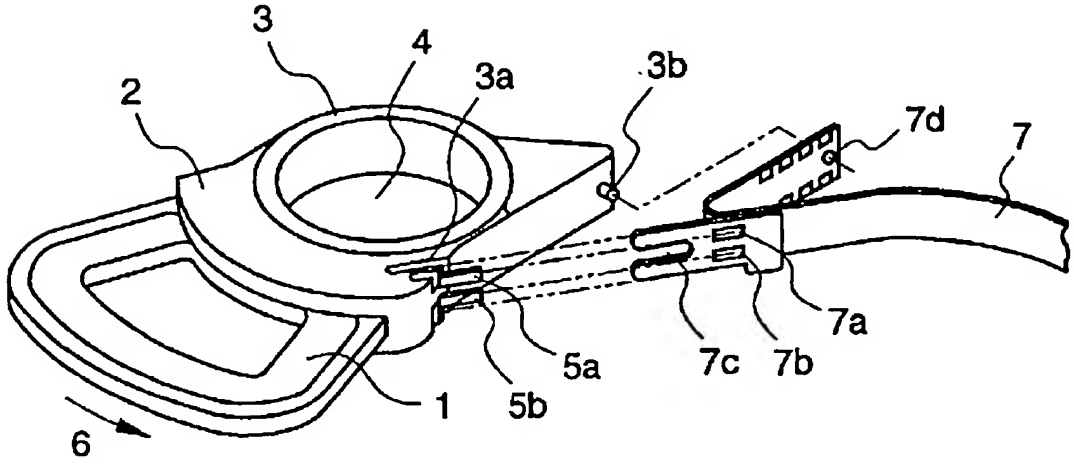


Fig.1

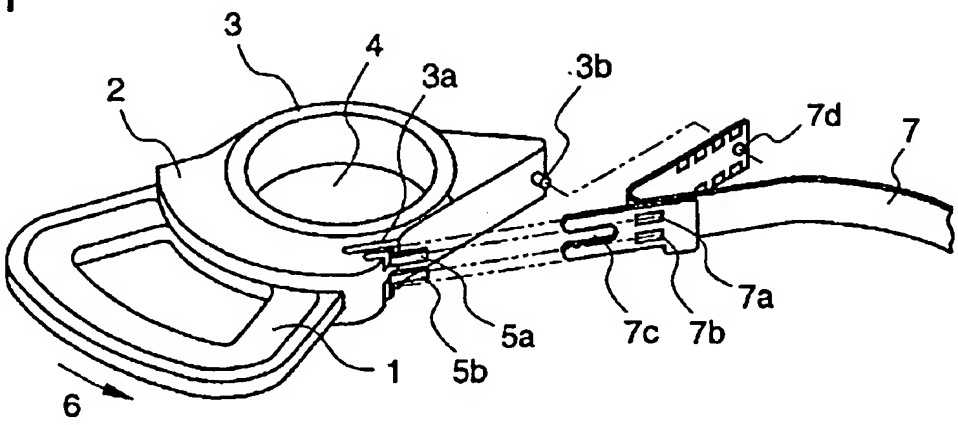

3
4
3a
3b
2
7d
7
7a
5a
7c
7b
1
5b
6

Fig.2

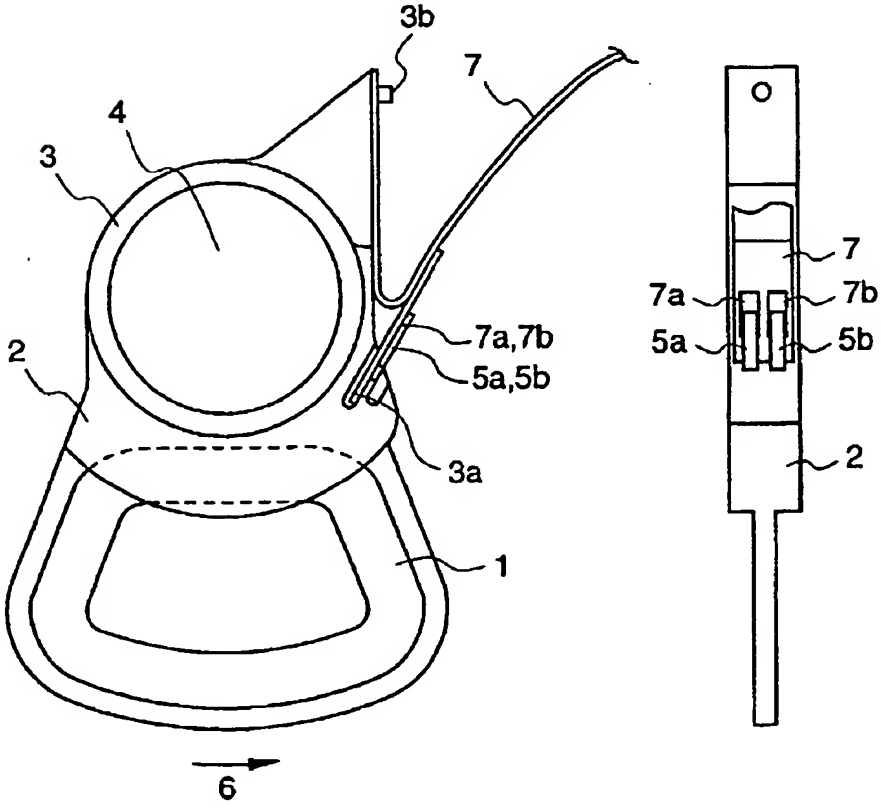

3b
7
4
3
7a,7b
5a,5b
2
3a
1
6
7
7a
7b
5a
5b
2

Fig.3

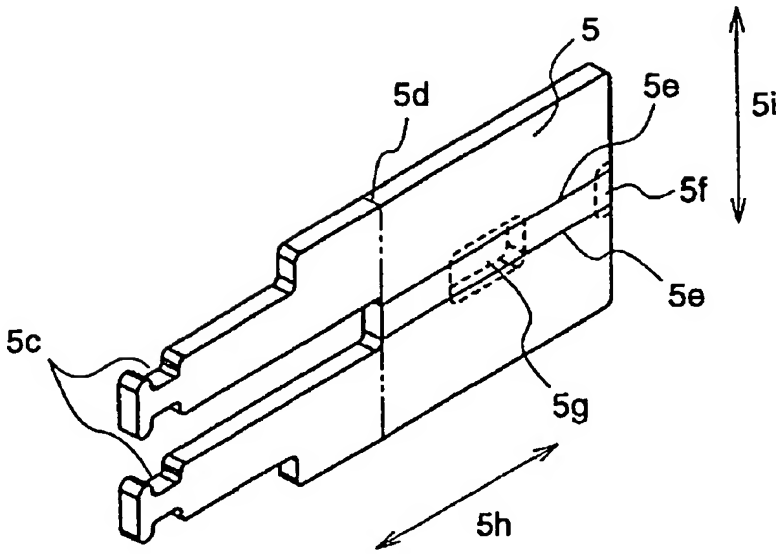


Fig.4

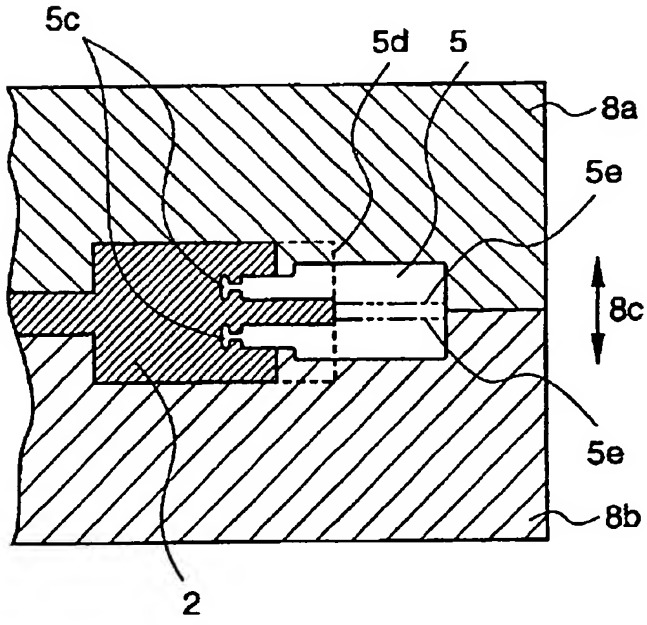


Fig.5

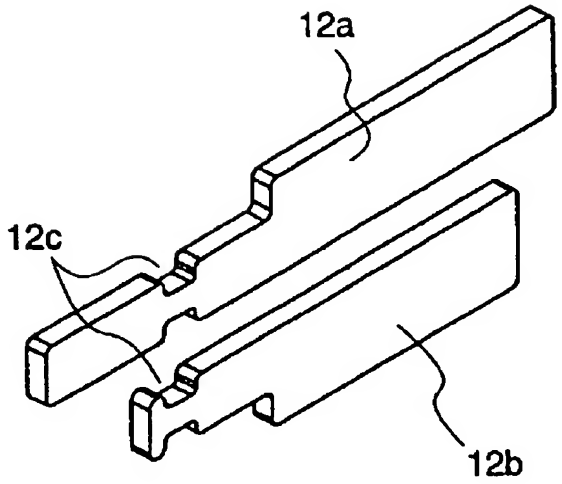


Fig.6

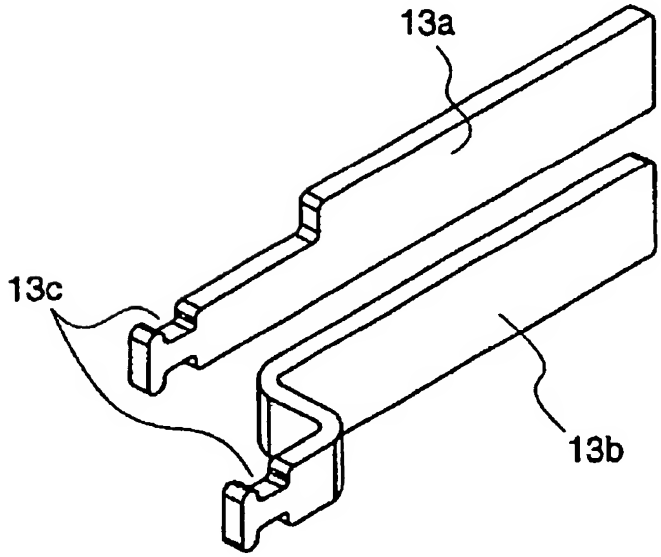


Fig.7

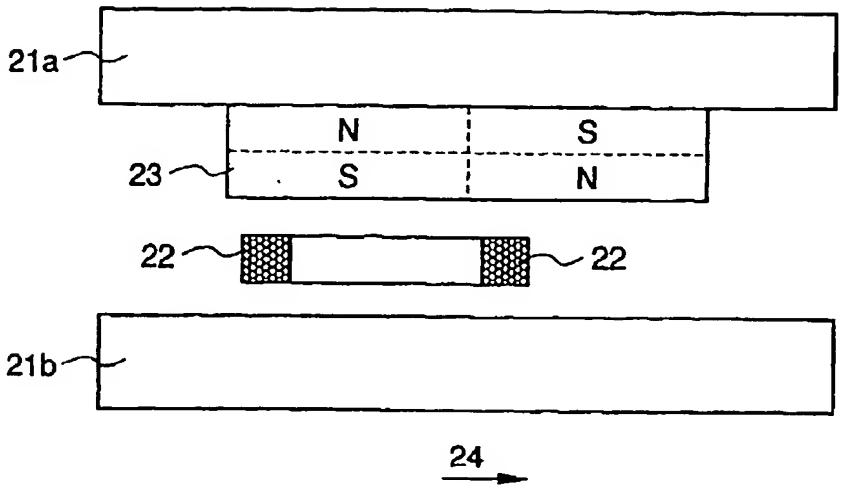


Fig.8

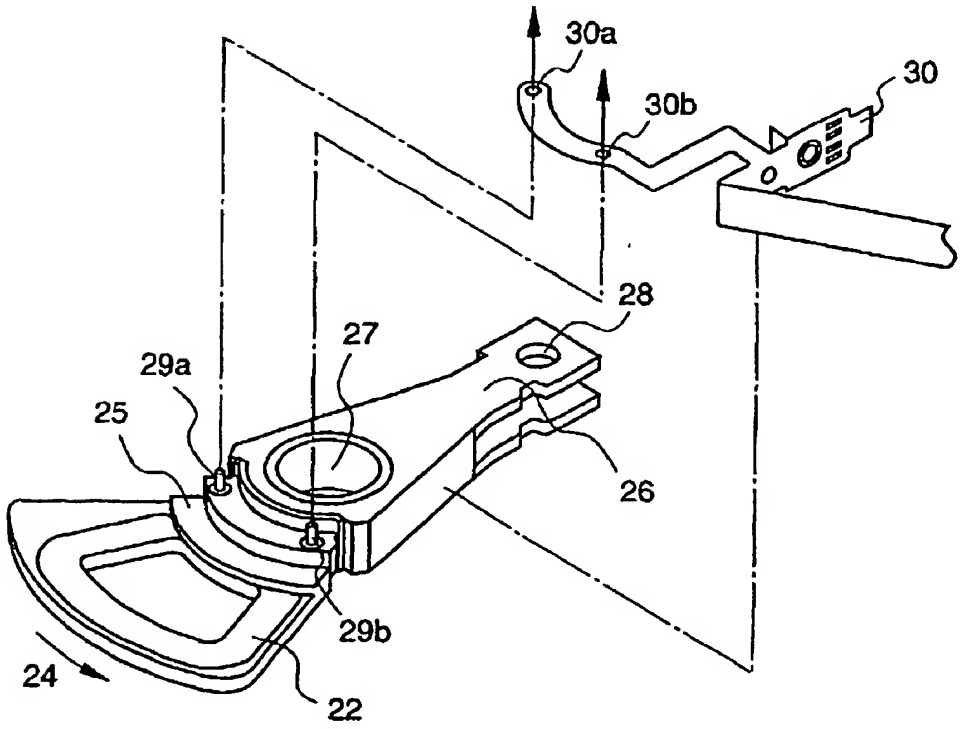


Fig.9

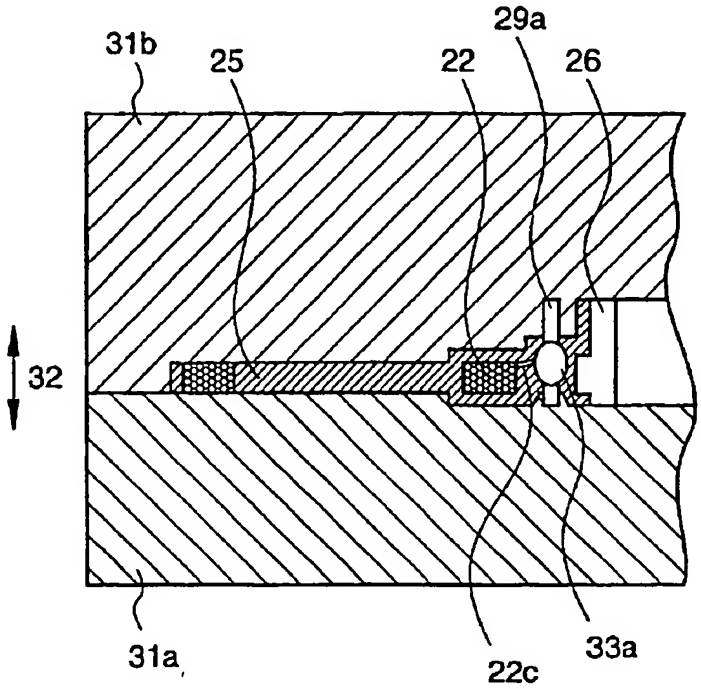
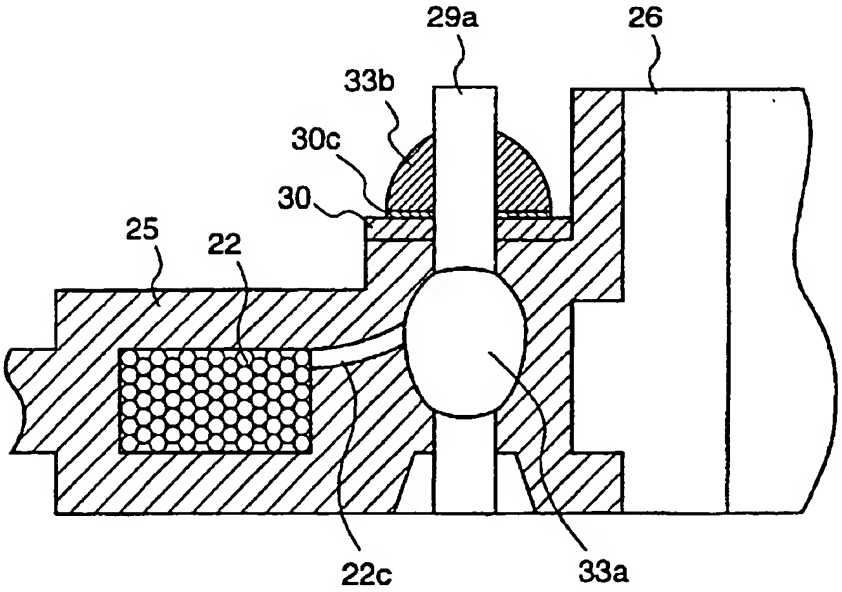


Fig.10



ACTUATOR

TECHNICAL FIELD

[0001] The present invention relates to an actuator which is used for transferring a head of a magnetic disk drive and the like.

BACKGROUND ART

[0002] Hereinafter, a conventional actuator will be described with reference to FIGS. 7 to 10.

[0003] FIGS. 7 to 10 are diagrams for illustrating structures of a conventional actuator; **FIG. 7** is a sectional view illustrating the actuator; **FIG. 8** is a perspective view illustrating a moving part of the actuator; **FIG. 9** is a sectional view illustrating a metallic mold for forming the moving part of the actuator; and **FIG. 10** is an enlarged view illustrating a terminal section of **FIG. 9**.

[0004] In **FIG. 7**, numerals **21***a* and **21***b* denote opposite yokes which are provided with a predetermined space therebetween; numeral **22** denotes a coil which is movably wound between the yokes **21***a* and **21***b*; and numeral **23** denotes a permanent magnet which is attached between the yokes **21***a* and **21***b* and to at least one of the yokes and applies a magnetic field to the coil **22**. The permanent magnet **23** is attached to the yoke **21***a* in the example shown in **FIG. 7**, magnetized as shown in figure, and applies a magnetic flux to the coil **22**.

[0005] In **FIG. 8**, numeral **22** denotes the coil which is movably wound between the yokes **21***a* and **21***b*, and numeral **25** denotes a holding member made of a thermoplastic resin, which holds the coil **22**. Numeral **26** denotes a housing made of metal material such as aluminum alloy and the like, and a rotation constraint means can be fitted in a hole **27** provided at the housing **26** and a magnetic head can be fitted in a hole **28** (the rotation constraint means and the magnetic head are not shown in this figure). Numerals **29***a* and **29***b* denote terminals to which both end parts of the strand of the coil **22** are electrically connected. Usually, the terminals **29***a* and **29***b* are inexpensive, so pin-shaped ones made of conductive material are employed. Numeral **30** denotes a flexible circuit board including a conductor part which transmits a current from a current generation source (not shown) to the coil **22** via the pin-shaped terminals **29***a* and **29***b*.

[0006] In **FIG. 8**, the coil **22** is wound in a shape of a trapezoid, and when a current in a clockwise direction is passed through the coil **22**, a force is generated in the coil **22** in accordance with the Fleming's left hand rule, and the coil **22** moves in the direction of an arrow **24**. In this case, in **FIG. 7**, in a part on the right side of the coil **22** in the page, a current flows from the far side of the page to the near side of the page, and in a part on the left side of the coil **22** in this page, the current flows from the near side of the page to the far side of the page. When a current in a counterclockwise direction is passed through the coil **22**, the coil **22** moves in the opposite direction to the arrow **24**. In this case, in **FIG. 7**, in a part on the right side of the coil **22** in this page, a current flows from the near side of the page to the far side of the page, and in a part on the left side of the coil **22** in the page, a current flows from the far side of the page to the near side of the page. Here, the coil **22** is set by a stopper (not shown) to move only within a coil movable range.

[0007] Next, a production method of the conventional actuator movable part will be described with reference to **FIGS. 8 and 9**.

[0008] In **FIG. 9**, numerals **31***a* and **31***b* denote metallic molds and, for convenience' sake, the metallic mold **31***b* is described on the upper part, but the mold **31***b* is a lower mold and the mold **31***a* is an upper mold. Numeral **32** denotes a direction of separation between the metallic molds **31***a* and **31***b*.

[0009] Initially, the coil **22**, the pin-shaped terminals **29***a* and **29***b* (not shown in **FIG. 9**) to which the coil **22** is connected and the housing **26** are positioned in the metallic molds **31***a* and **31***b*, and the thermoplastic resin is injected into the metallic molds **31***a* and **31***b*, thereby forming the holding member **25**, and integrating the coil **22**, the housing **26**, and the pin-shaped terminals **29***a* and **29***b*. In **FIG. 9**, in the metallic molds **31***a* and **31***b*, the longitudinal direction of the pin-shaped terminals **29***a* and **29***b* is directed in the same direction as the metallic mold separation direction **32**.

[0010] Next, the flexible circuit board **30** is fixed on the housing **26** by a fastening means such as a screw (not shown). At this time, parts of the pin-shaped terminals **29***a* and **29***b*, exposed from the holding member **25**, are inserted into the holes **30***a* and **30***b* provided at the conductor end part of the flexible circuit board **30**, and projecting parts of the pin-shaped terminals **29***a* and **29***b* and the conductor part are connected electrically with solder.

[0011] Next, a structure of the pin-shaped terminal section in the conventional actuator movable part will be described with reference to **FIG. 10**.

[0012] In this figure, one end of the pin-shaped terminal **29***a* is held by the holding member **25**, and the other end is exposed from the holding member **25**. The coil strand **22***c* is wound on a part of the pin-shaped terminals **29***a*, which is buried in the holding member **25**, and electrically connected thereto with solder **33***a*. Further, in a state where the exposed part of the pin-shaped terminal **29***a* is inserted into the hole **30***a* provided on the flexible circuit board **30**, the exposed part and the conductor part **30***c* of the flexible circuit board **30** are electrically connected with solder **33***b*. In addition, the pin-shaped terminal **29***b* is similarly connected to the coil **22** and the flexible circuit board **30**.

[0013] According to the above-mentioned construction, the coil is of flat type and therefore the metallic mold separation direction (**32**) is set to be perpendicular to the coil moving direction, for convenience in production of the metallic molds. In addition, it is difficult to arrange the longitudinal direction of the pin-shaped terminal parallel with the coil moving direction for the convenience in production of the metallic molds, and therefore the longitudinal direction of the pin-shaped terminal is directed in the same direction as the metallic mold separating direction.

[0014] Therefore, in order to ensure the length of the pin-shaped terminal, which is required for the positioning in the metallic mold, a prescribed or more length is required. Further, because the pin-shaped terminals exposed from the holding member are inserted into the holes at the conductor end part of the flexible circuit board and electrically connected by the solder, the exposed parts of the pin-shaped terminals cannot be shortened. In addition, the part of the pin-shaped terminal, which is buried in the holding member,

cannot be shortened because the part is wound by the coil strand and electrically connected thereto with the solder.

[0015] The longitudinal direction of the pin-shaped terminal formed as described above corresponds to the thickness direction of an apparatus into which the actuator is installed, and in such construction, while thinner apparatus are demanded in recent years, it is very difficult to provide these thinner apparatus.

[0016] In addition, as described above, in a state where pin-shaped terminals are inserted into the holes provided on the flexible circuit board, the pin-shaped terminals are covered and connected by the solder, and therefore the pin-shaped terminal connecting parts on the flexible circuit board become larger. As a result, adjacent permanent magnets or yokes become smaller, which prevents the whole actuator from generating a large torque.

[0017] Further, since the two pin-shaped terminals have the same shape, when these terminals are positioned in the metallic molds, they may be erroneously placed. Thereby, the direction of the current which passes through the coil becomes opposite to the proper direction, which causes a malfunction that the movable part of the actuator moves in the opposite direction.

[0018] The present invention is made to solve the above-described problem and has for its object to provide an actuator which can thin an apparatus into which the actuator is installed and prevent the resultant malfunction.

DISCLOSURE OF INVENTION

[0019] The present invention is made to achieve the above-mentioned object, and an actuator according to claim 1 comprises: plural yokes which confront to each other with providing a predetermined space therebetween; a coil which is wound and placed movable between the plural yokes; a permanent magnet which is located between the plural yokes and attached to at least one of the yokes, and applies a magnetic field to the coil; a holding member for holding the coil, which is made of a thermoplastic resin; a housing to which the holding member is attached at one end and a functional member can be attached at the other end; and a flexible circuit board which transmits a current from the outside to the coil, and portions of two plate-shaped terminals to which opposite end parts of a strand of the coil are electrically connected are buried in the holding member and exposed parts of the both plate-shaped terminals are electrically connected to a conductor part of the flexible circuit board.

[0020] According to claim 2 of the present invention, in the actuator as defined in claim 1, the two plate-shaped terminals are buried in a side part of the holding member so that longitudinal directions of the terminals are parallel with a coil movable direction.

[0021] According to claim 3 of the present invention, in the actuator as defined in claim 1, the two plate-shaped terminals are buried in a side part of the holding member so that longitudinal directions of the terminals are parallel with a coil movable direction as well as the both plate-shaped terminals are provided on a flat surface.

[0022] According to claim 4 of the present invention, in the actuator as defined in claim 1, the two plate-shaped terminals are formed by burying portions of the integrally constructed two plate-shaped terminals in the holding member which is made of the thermoplastic resin, molding, and thereafter separating exposed part of the plate-shaped terminal into two.

[0023] According to claim 5 of the present invention, in the actuator as defined in claim 1, end parts of the two plate-shaped terminals, which end parts are connected to the coil strand, have different shapes, respectively.

[0024] According to claim 6 of the present invention, in the actuator as defined in claim 5, one of the end parts of the two plate-shaped terminals, which end parts are connected to the coil strand, is longer than the other.

[0025] According to claim 7 of the present invention, in the actuator as defined in claim 5, one of the end parts of the two plate-shaped terminals, which end parts are connected to the coil strand, is crank-shaped.

[0026] As described above, an actuator- according to claim 1 of the present invention comprises: plural yokes which confront to each other with providing a predetermined space therebetween; a coil which is wound and placed movable between the plural yokes; a permanent magnet which is located between the plural yokes and attached to at least one of the yokes, and applies a magnetic field to the coil; a holding member for holding the coil, which is made of a thermoplastic resin; a housing to which the holding member is attached at one end and a functional member can be attached at the other end; and a flexible circuit board which transmits a current from the outside to the coil, and portions of two plate-shaped terminals to which opposite end parts of a strand of the coil are electrically connected are buried in the holding member and exposed parts of the both plate-shaped terminals are electrically connected to a conductor part of the flexible circuit board. Therefore, the both plate-shaped terminals can be placed at arbitrary positions in the holding member, and a movable part of an actuator which consists of the coil, the holding member, the housing, the plate-shaped terminals and the flexible circuit board can be thinned, and consequently an apparatus into which the actuator of the present invention is installed can be thinned.

[0027] According to claim 2 of the present invention, in the actuator as defined in claim 1, the two plate-shaped terminals are buried in a side part of the holding member so that longitudinal directions of the terminals are parallel with a coil movable direction. Therefore, a movable part of the actuator which consists of the coil, the holding member, the housing, the plate-shaped terminals and the flexible circuit board can be thinned, and consequently an apparatus into which the actuator of the present invention is installed can be thinned.

[0028] According to claim 3 of the present invention, in the actuator as defined in claim 1, the two plate-shaped terminals are buried in a side part of the holding member so that longitudinal directions of the terminals are parallel with a coil movable direction as well as the both plate-shaped terminals are provided on a flat surface. Therefore, the connecting parts of the both plate-shaped terminals and the flexible circuit board can be smaller, and a movable part of the actuator which consists of the coil, the holding member, the housing, the plate-shaped terminals and the flexible circuit board can be thinned, and consequently an apparatus

into which the actuator of the present invention is installed can be thinned. Further, due to the miniaturization of the connecting parts of the plate-shaped terminals and the flexible circuit board, adjacent yokes or permanent magnets can be enlarged, whereby a large torque can be obtained.

[0029] According to claim 4 of the present invention, in the actuator as defined in claim 1, the two plate-shaped terminals are formed by burying portions of the integrally constructed two plate-shaped terminals in the holding member which is made of the thermoplastic resin, molding, and thereafter separating exposed part of the plate-shaped terminal into two. Therefore, the both plate-shaped terminals can be easily formed on the flat surface, and a movable part of the actuator which consists of the coil, the holding member, the housing, the plate-shaped terminals and the flexible circuit board, and consequently an apparatus into which the actuator of the present invention is installed can be thinned. Further, when molded in metallic molds, the integrated two plate-shaped terminals are employed, and therefore handling of the terminals becomes easier than that of the prior art.

[0030] According to claim 5 of the present invention, in the actuator as defined in claim 1, end parts of the two plate-shaped terminals, which end parts are connected to the coil strand, have different shapes, respectively. Therefore, the discrimination between the two plate-shaped terminals is easier and the assembly failure of erroneously connecting the terminals and the coil strand can be prevented. In addition, when molded in metallic molds, an erroneous placement of the plate-shaped terminal in the metallic molds is prevented and the both plate-shaped terminals can be correctly connected at predetermined positions of the flexible circuit board, whereby the malfunction that the coil moves in the opposite direction can be prevented.

[0031] According to claim 6 of the present invention, in the actuator as defined in claim 5, one of the end parts of the two plate-shaped terminals, which end parts are connected to the coil strand, is longer than the other. Therefore, the discrimination between the both plate-shaped terminals is easier, and the assembly failure of erroneously connecting the terminals and the coil strand can be prevented. In addition, when molded in the metallic molds, an erroneous placement of the plate-shaped terminal in the metallic molds is prevented and the both plate-shaped terminals can be correctly connected at predetermined positions of the flexible circuit board, whereby the malfunction that the coil moves in the opposite direction can be prevented.

[0032] According to claim 7 of the present invention, in the actuator as defined in claim 5, one of the end parts of the two plate-shaped terminals, which end parts are connected to the coil strand, is crank-shaped. Therefore, the discrimination between the both plate-shaped terminals is easier, and the assembly failure of erroneously connecting the terminals and the coil strand can be prevented. In addition, when molded in the metallic molds, an erroneous placement of the plate-shaped terminal in the metallic molds is prevented and the both plate-shaped terminals can be correctly connected at predetermined positions of the flexible circuit board, and the malfunction that the coil moves in the opposite direction can be prevented.

BRIEF DESCRIPTION OF DRAWINGS

[0033] **FIG. 1** is a perspective view for illustrating a structure of a movable part of an actuator according to a first embodiment of the present invention.

[0034] **FIG. 2** is a plan view for illustrating a structure of the actuator movable part according to the first embodiment of the present invention.

[0035] **FIG. 3** is an enlarged perspective view for illustrating a structure of a plate-shaped terminal in the actuator movable part according to the first embodiment of the present invention.

[0036] **FIG. 4** is a partial sectional view of metallic molds for forming the actuator movable part according to the first embodiment of the present invention.

[0037] **FIG. 5** is an enlarged perspective view for illustrating structures of plate-shaped terminals in a movable part of an actuator according to a second embodiment of the present invention.

[0038] **FIG. 6** is an enlarged perspective view for illustrating another structures of plate-shaped terminals in the actuator movable part according to the second embodiment of the present invention.

[0039] **FIG. 7** is a sectional view illustrating a conventional actuator.

[0040] **FIG. 8** is a perspective view for illustrating a structure of a conventional actuator movable part.

[0041] **FIG. 9** is a sectional view illustrating metallic molds for forming the conventional actuator movable part.

[0042] **FIG. 10** is an enlarged view of a connecting part between pin-shaped terminals and a flexible circuit board in the conventional actuator movable part.

BEST MODE TO EXECUTE THE INVENTION

[0043] (Embodiment 1)

[0044] Hereinafter, an actuator according to a first embodiment of the present invention will be described.

[0045] **FIGS. 1 and 2** are diagrams for illustrating a structure of a movable part of the actuator according to the present invention, and **FIG. 1** is a perspective view and **FIG. 2** is a plan view.

[0046] In figures, numeral **1** denotes a coil and numeral **2** denotes a holding member for holding the coil **1**, which is made of a thermoplastic resin. Numeral **3** denotes a housing made of a metal material such as aluminum alloy or thermoplastic resin, and a rotation constraint means and a magnetic head can be fitted in a hole **4** provided at the housing **3** (the rotation constraint means and the magnetic head are not shown). Numerals **5***a* and **5***b* denote plate-shaped terminals to which opposite end parts of a strand of the coil **1** are electrically connected, respectively, and numeral **7** denotes a flexible circuit board comprising a conductor part which transmits a current from a current generation source (not shown) to the coil **1** via the plate-shaped terminals **5***a* and **5***b*. As characteristics of this first embodiment, the two plate-shaped terminals **5***a* and **5***b* are provided on the side of the holding member **2** in the same

direction as the coil moving direction **6**, and the two plate-shaped terminals **5***a* and **5***b* are arranged so as to be flush with each other.

[0047] The actuator movable part is sandwiched by plural yokes and a permanent magnet (not shown) which is attached to one of the yokes, like the conventional structure.

[0048] The coil **1** is wound in a shape of a trapezoid, and when a current in the clockwise direction is passed through the coil **1**, a force is generated in coil **1** in accordance with the Fleming's left hand rule and the coil **1** moves in the direction shown by an arrow **6**. When a current in the counterclockwise direction is passed through the coil **1**, the coil **1** moves into the opposite direction to that of the arrow **6**. The coil **1** is set by a stopper (not shown) to be able to move only within the coil moving range.

[0049] Next, the manufacturing method of the actuator movable part according to the first embodiment of the present invention will be described with reference to FIGS. **1** to **4**.

[0050] **FIG. 3** is an enlarged perspective view for illustrating structures of plate-shaped terminals in the actuator movable part, and **FIG. 4** is a sectional view of metallic molds for forming the actuator movable part. Further, for the same components as those in **FIGS. 1 and 2**, the same reference numerals are used and the descriptions will not be given.

[0051] In **FIG. 3**, the plate-shaped terminal **5** is plate-shaped. One end of the plate-shaped terminal **5** is in one piece, and the other end is forked. The constricted parts **5***c* of the two end parts of the plate-shaped terminal are wound by the opposite ends of the coil strand **1**, respectively, and electrically connected thereto with solder. Numerals **5***h* and **5***i* denote the longitudinal direction and the transverse direction of the plate-shaped terminal **5**, respectively.

[0052] In **FIG. 4**, numerals **8***a* and **8***b* denote upper and lower metallic molds, respectively, and numeral **8***c* denotes a separation direction of the upper and lower metallic molds **8***a* and **8***b*. The metallic mold separation direction Bc is set to be the direction perpendicular to the coil moving direction **6** because the coil **1** is of flat type and the direction is convenient for positioning the coil **1** in the metallic molds **8***a* and **8***b*.

[0053] The plate-shaped terminal **5** is a terminal as characteristics of the present invention and, since it is plate-shaped, both of the longitudinal direction **5***h* and the transverse direction **5***i* of the plate-shaped terminal **5** can be arranged parallel with the coil moving direction **6** in metallic molds **8***a* and **8***b*, and the plate-shaped terminal **5** can be placed on any of top, bottom and side surfaces of the holding member **2**. In this case, the metallic mold separation direction **8***c* is perpendicular to the coil moving direction **6**. However, even when the metallic molds having other separation directions are employed, the plate-shaped terminal **5** can be placed similarly on any of the top, bottom, and side surfaces of the holding member **2**.

[0054] According to the manufacturing method of the actuator movable part of the present invention, initially, the coil **1**, the housing **3** and the plate-shaped terminal **5** connected to the coil **1** are placed in the metallic molds **8***a* and **8***b*, and the thermoplastic resin is injected into the metallic molds **8***a* and **8***b*, thereby forming the holding member **2**, and integrating the coil **1**, the holding member **2**, the housing **3** and the plate-shaped terminal **5**. According to this embodiment, the position of the plate-shaped terminal **5** is a position as characteristics of the present invention and, when the plate-shaped terminal **5** is positioned in the metallic molds **8***a* and **8***b*, the longitudinal direction **5***h* of the plate-shaped terminal **5** is directed in the coil moving direction **6**.

[0055] After the resin is molded, a portion of the plate-shaped terminal **5** from a dash-double-dot line **5***d* toward the forked end parts is held by the holding member **2**, and the integral side is exposed. A cut-off part **5***e* surrounded by a dash-double-dot line is removed from the exposed part of the plate-shaped terminal **5**, thereby forming two plate-shaped terminals **5***a* and **5***b*.

[0056] When two terminals in the same shape are separated, because of the structures of the metallic molds **8***a* and **8***b*, the two separated plate-shaped terminals **5***a* and **5***b* can not be provided on a flat surface on the side of the holding member **2** as shown in **FIG. 1**. However, like in this embodiment, when one plate-shaped terminal **5** is placed in the metallic molds **8***a* and **8***b* as shown in **FIG. 4** and molded with a resin, and thereafter the cut-off part **5***e* of the plate-shaped terminal **5** is removed, the above-mentioned construction can be easily realized. In addition, one terminal is very small, and therefore the handling becomes easier than that of the prior art by using the terminal in which the two plate-shaped terminals **5***a* and **5***b* are previously integrated.

[0057] In addition, as shown in **FIG. 3**, in the cut-off part **5***e* of the plate-shaped terminal **5**, an indented part **5***f* or a hole **5***g* as shown by broken lines can be provided. Thereby, the plate-shaped terminal **5** can be easily separated into two.

[0058] Next, as shown in **FIG. 1**, the flexible circuit board **7** is attached to the holding member **2**. A U-shaped end part **7***c* of the flexible circuit board **7** is inserted into a slot **3***a* of the holding member **2** and a projection **3***b* provided at the housing **3** is inserted into a hole **7***d*. The plate-shaped terminals **5***a* and **5***b* are brought into surface contact with connecting parts **7***a* and **7***b* provided at the conductor part of the flexible circuit board **7** and the contacted sections are electrically connected to each other with solder (not shown).

[0059] As described above, the plate-shaped terminals **5***a* and **5***b* provided on the side of the holding member **2** so as to be flush are brought into surface-contact with the connecting parts **7***a* and **7***b* included in the flexible circuit board **7**, and soldered. Therefore, a thinner actuator movable part can be realized and, as a result, an apparatus into which the whole actuator is installed is thinned. Further, the miniaturization of the connecting parts of the flexible circuit board **7** and the plate-shaped terminals **5***a* and **5***b* can enlarge the adjacent yokes or permanent magnet, whereby a large torque can be obtained.

[0060] (Embodiment 2)

[0061] Plate-shaped terminals in a movable part of an actuator according to a second embodiment of the present invention will be described with reference to **FIGS. 5 and 6**. Here, as for parts of a structure and a manufacturing method of the actuator, which are common to those of the first embodiment, the description will not be given.

[0062] FIG. 5 is an enlarged perspective view for illustrating an example of structures of plate-shaped terminals in the actuator movable part of the present invention.

[0063] In this figure, plate-shaped terminals **12***a* and **12***b* are terminals as characteristics of the present invention, and lengths of end parts of one terminal are longer than those of the other. Constricted parts **12***c* in the end parts of these plate-shaped terminals **12***a* and **12***b* are wound by the opposite ends of the coil strand, respectively, and electrically connected thereto with solder. At this time, the lengths of the end parts of the two plate-shaped terminals **12***a* and **12***b* are different, and therefore the discrimination between the plate-shaped terminals **12***a* and **12***b* is easier and an assembly failure of improperly connecting the connecting terminals and the ends of the coil strand **1** can be prevented. In addition, when the plate-shaped terminals **12***a* and **12***b* are positioned in the metallic molds, erroneous positioning of the both plate-shaped terminals **12***a* and **12***b* is prevented, the both plate-shaped terminals **12***a* and **12***b* can be correctly connected to predetermined connecting parts **7***a* and **7***b* of the flexible circuit board **7**, and the malfunction that the moving direction of coil **1** becomes opposite can be prevented.

[0064] FIG. 6 is an enlarged perspective view for illustrating another example of structures of plate-shaped terminals in the actuator movable part of the present invention.

[0065] In this figure, plate-shaped terminals **13***a* and **13***b* are terminals as characteristics of the present invention, and one end part thereof is crank-shaped. Constricted parts **13***c* of the end parts of the plate-shaped terminals **13***a* and **13***b* are wound by the opposite ends of the coil strand **1**, respectively, and electrically connected thereto with solder. Then, one of the end parts of the two plate-shaped terminals **13***a* and **13***b* has a shape different from that of the other, and therefore the discrimination between the plate-shaped terminals **13***a* and **13***b* is easier, whereby the assembly failure of erroneously connecting the terminals and the opposite ends of the coil strand **1** can be prevented. In addition, when the plate-shaped terminals **13***a* and **13***b* are positioned in the metallic molds, an erroneous placement of the both plate-shaped terminals **13***a* and **13***b* is prevented, and the both plate-shaped terminals **13***a* and **13***b* can be correctly connected to the predetermined connecting parts **7***a* and **7***b* of the flexible circuit board **7**, whereby the malfunction that the coil **1** moves in the opposite direction can be prevented.

APPLICABILITY IN INDUSTRY

[0066] In an actuator which is used for transferring a head of a magnetic disk drive and the like, terminals for applying a current to a coil are made plate-shaped and provided on the side of a housing, whereby an apparatus into which an actuator is installed is thinned, and further the shapes of two plate-shaped terminals are made different, whereby generation of defectives due to erroneous wiring at manufacturing actuators can be prevented.

1. An actuator which comprises: plural yokes which confront to each other with providing a predetermined space therebetween; a coil which is wound and placed movably between the plural yokes; a permanent magnet which is located between the plural yokes and attached to at least one of the yokes, and applies a magnetic field to the coil; a holding member for holding the coil, which is made of a thermoplastic resin; a housing to which the holding member is attached at one end and a functional member can be attached at the other end; and a flexible circuit board which transmits a current from the outside to the coil, wherein

portions of two plate-shaped terminals to which opposite end parts of a strand of the coil are electrically connected are buried in the holding member and exposed parts of the both plate-shaped terminals are electrically connected to a conductor part of the flexible circuit board.

2. The actuator as defined in claim 1, wherein

the two plate-shaped terminals

are buried in a side part of the holding member so that longitudinal directions of the terminals are parallel with a coil movable direction.

3. The actuator as defined in claim 1, wherein

the two plate-shaped terminals

are buried in a side part of the holding member so that longitudinal directions of the terminals are parallel with a coil movable direction as well as the both plate-shaped terminals are provided on a flat surface.

4. The actuator as defined in claim 1, wherein

the two plate-shaped terminals

are formed by burying portions of the integrally constructed two plate-shaped terminals in the holding member which is made of the thermoplastic resin, molding, and thereafter separating exposed part of the plate-shaped terminal into two.

5. The actuator as defined in claim 1, wherein

end parts of the two plate-shaped terminals, which end parts are connected to the coil strand, have different shapes, respectively.

6. The actuator as defined in claim 5, wherein

one of the end parts of the two plate-shaped terminals, which end parts are connected to the coil strand, is longer than the other.

7. The actuator as defined in claim 5, wherein

one of the end parts of the two plate-shaped terminals, which end parts are connected to the coil strand, is crank-shaped.

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